CLAIMS

What I claim as my invention is:

1. A multi-roller ball assembly (20) for any types of constant velocity joints with torque transmitting balls comprising:

a roller shaft (24) forming a hollow shaft member as a common shaft for a plurality of sub-rollers (21, 22, 23) that spin around said roller shaft (24) and comprising a larger diameter center cylindrical portion (24c) for the center roller (21), two tapered portions (24b) and two smaller diameter cylindrical portions (24a) for the half-spherical rollers (22,23), and an axis hole (24d) for the sliding pin (25); and

a center roller (21) forming a ring-shaped sub-roller member and providing a rolling contact against the cage flats (4e, 4f) of the constant velocity joint cage (4); and

a pair of half spherical rollers (22, 23) disposed at and spin around said roller shaft (24) providing a rolling contacts against the inner and/or outer grooves (1a, 2a) of the constant velocity joint races; and

a sliding pin (25) positioned along the axis hole (24d) of said roller shaft (24) allowing said roller shaft (24) to slide along said sliding pin (25) and either ends of said sliding pin (25) mates into the cage web slots (4i) of the modified cage (4) maintaining the spin-axis orientation of said multi-roller ball assembly (20) with respect to the cage window (4a).

2. A multi-roller ball assembly (20) according to claim 1, wherein said center roller (21) is disposed at the cylindrical center surface (24c) of said roller shaft (24) allowing said center roller (21) to spin around and slide along said roller shaft (24) within the axial gap between said half spherical rollers (22, 23).

3. A multi-roller ball assembly (20) according to claim 1, wherein said center roller (21) is disposed at the roller seat surfaces (22g, 23g) of said half spherical rollers (22, 23) allowing said center roller (21) to spin around and slide along said half spherical rollers (22, 23).

4. A multi-roller ball assembly (20) according to claim 1, wherein said center roller (21) is combined with said roller shaft (24) forming a disc shaft (32) that functions both as a common shaft and as a center roller.

5. A multi-roller ball assembly (20) according to claim 1, wherein said center roller (21) is removed so that all of the load from the cage 4 is carried by said sliding pin (25) or by the lug shaft (35) which is a modified version of said sliding pin (25).

6. A multi-roller ball assembly (20) according to claim 1, wherein said sliding pin (25) is in the shape of a slender rod.

7. A multi-roller ball assembly (20) according to claim 1, wherein said sliding pin (25) is modified to form a lug shaft (35) whose sliding body (35a) has a larger diameter and whose two ends taper down forming a smaller diameter lugs (35b, 35c) that mate into the cage web slots (4i).

8. A multi-roller ball assembly (20) according to claim 1, wherein said roller shaft (24) is made of a solid metal, an oil-impregnated sintered metal, or any other sliding bearing material facilitating a smooth rotation of said sub-rollers (21, 22, 23).

9. A multi-roller ball assembly (20) according to claim 1, wherein the two sets of sliding or needle bearings (27, 28) are optionally disposed at the interfaces between said roller shaft (24) and said half spherical rollers (22, 23).

10. A multi-roller ball assembly (20) according to claim 1, wherein a radial sliding or needle bearing (26) is optionally disposed at the shaft hole of said center roller (21).

11. A multi-roller ball assembly (20) according to claim 1, wherein a pair of retaining rings (29, 30) are optionally disposed at the either ends of said roller shaft (24) keeping said center roller (21) and said half spherical rollers (22, 23) from sliding out of said roller shaft (24) during an assembly process of the constant velocity joints.

12. A multi-roller ball assembly (20) according to claim 1, said roller shaft (24) has a snap on feature at the either ends of said roller shaft (24) keeping said center roller (21) and said half spherical rollers (22, 23) from sliding out of said roller shaft (24) during an assembly process of the constant velocity joints.